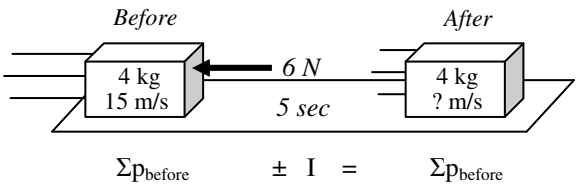
Due Tues., Dec 4

2012 PreAP Momentum 2

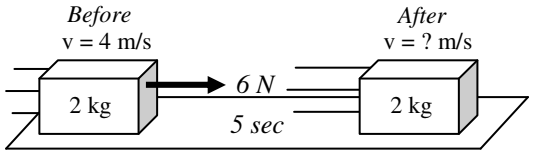
With some of Energy 11



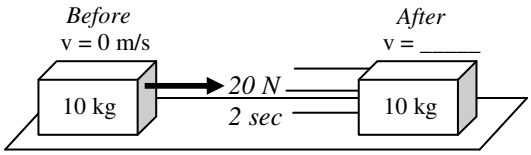
$\Sigma p_{before} \quad \pm I = \quad \Sigma p_{before}$

So, this is our equation: $\Sigma p_{before} \pm I = \Sigma p_{before}$. Again, this is like energy, where: $\Sigma E_{before} \pm W = \Sigma E_{before}$.

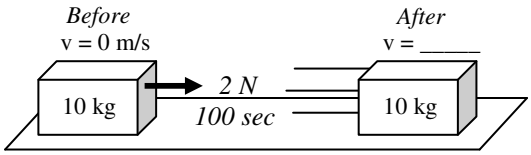
1) A 4 kg object is moving 15 m/s. A force is applied to the left.
   A. Is the impulse positive or negative?
   B. Will the object gain or lose momentum?
   C. * Fill in the information under the diagram and solve for the final velocity.



2) A 2kg object at moving 4m/s. A 6N force pushes for 5 sec. Using the same method as above, calculate the final speed of the object.



$p_{before} =$ $\quad I =$ $\quad p_{after} =$

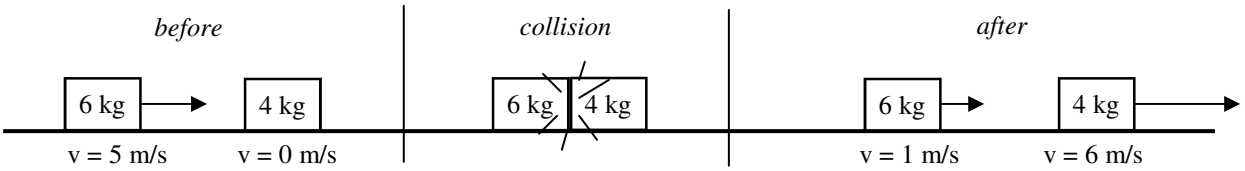


$p_{before} =$ $\quad I =$ $\quad p_{after} =$

3) Two identical 10 kg objects begin at rest, as shown above.
   A. On the diagram, calculate and label the initial momentums and impulses for each object.
   B. * Calculate the final momentum of each.
   C. Calculate the final velocity of each object.
   D. Which force gave the bigger impulse?
   E. Which object (left or right) had the bigger final velocity?

4) So, do you have to use a big force to make a big impulse?

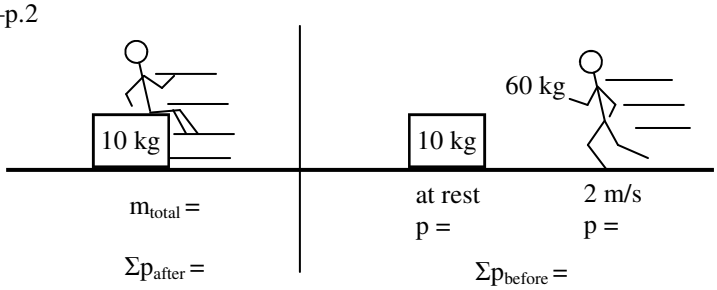
5) Consider two other forces. Force A is 75N. Force B is 3N. Which one gives the bigger impulse?



$\Sigma p_{before} =$ $\quad \Sigma p_{after} =$

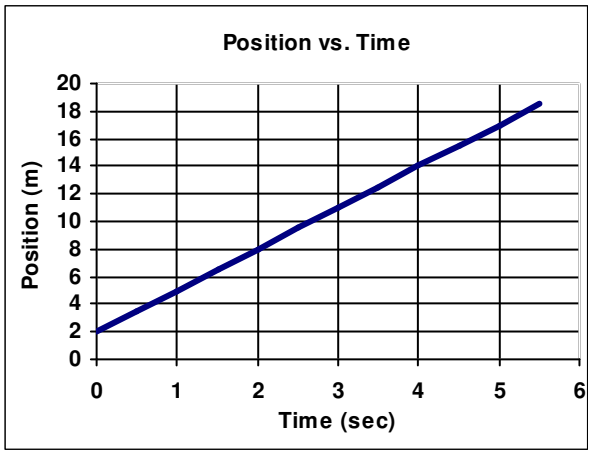
6) The diagram above shows two objects before and after they collide.
   A. On the diagram above calculate and label the net momentum before and after.

   B. How does the net momentum before compare with the net momentum after?
   (*This is ALWAYS the case when objects collide: momentum is conserved: $\Sigma p_{before} = \Sigma p_{after}$. And a collision is also when two objects hit and connect. Momentum is also conserved when objects split apart.)*

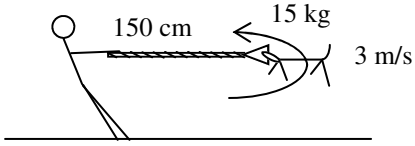


7) Slim Jim is running 2 m/s towards a box that is at rest. Jim then jumps onto the box and the two slide together
   A. On the diagram, calculate the net momentum before.
   B. What is the total mass of Jim and the box afterwards?
   C. Since momentum is always conserved, how much net momentum must there be afterwards?
   D. * Calculate the final velocity of Jim and the box.

8) The graph at the right shows an the motion of a 6 kg object.
   A. * Calculate the speed of the object from the graph.
   B. Calculate the momentum of the object.



From: "2011 PreAP Energy 11":



9) A tetherball is held by a rope and goes around in a circular path. Assume the rope is parallel to the ground.
   A. * Calculate the centripetal acceleration of Bim (the dog).
   B. What force provides this acceleration?
   C. * Calculate the centripetal force.
   D. What is the angle between the force and Bim's velocity?
   E. * Calculate the work the rope does in one half of a circle.

10) A 30 N object is lifted 5 m in 2 seconds.
   A. * How much potential energy was gained?
   B. How much work was done to lift the object?
   C. How much power was used to lift the object?

Q1C: 7.5 m/s Q3B: 40 kgm/s Q7D: −1.7 m/s Q8A: find the slope 9A: 6 m/s^2 9C: 90 N
9E: none. $W = Fd\cos\theta$, $\theta = 90°$ and $\cos 90° = 0$. 10A) 150 J